A Narrative Review: The Risk Factors and Prevalence of CAUTI Among Patients Admitted in Intensive Care Unit

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Abstract: CAUTI is one of the most common healthcare-associated diseases in the world. It mostly affects patients in hospitals who need indwelling urinary catheters. CAUTI results in heightened morbidity, extended hospitalizations, elevated treatment expenses, and the development of multidrug-resistant bacteria. To make patients safer and lower healthcare costs, it's vital to know how often it occurs, what causes it, how microbes spread, and how to stop it.

➢ *Method*

A narrative review was performed to examine articles published in the past decade concerning the prevalence, risk factors, microbiology, and prevention of CAUTI. Databases were examined for full-text research pertaining to adult people (≥18 years). Based on predefined inclusion criteria, 12 eligible studies were included. These studies had cross-sectional, cohort, retrospective, quasi-experimental, laboratory-based, and prospective designs. We collected information from each study regarding the sample characteristics, diagnostic criteria, pathogens identified, and the most significant results.

➢ *Results*

The reported prevalence of CAUTI varied significantly between studies, from 12.5% to 49.1%, with the greatest rates observed in ICU and long-term catheterized patients. The primary risk factors identified were prolonged catheterization, advanced age, female gender, diabetes, and inadequate perineal hygiene. Escherichia coli was always the most common pathogen in microbiological profiles, followed by Klebsiella, Enterococcus, Candida, and Pseudomonas species. Several studies indicated that antimicrobial resistance was very high, with up to 77% of bacteria being resistant to ampicillin and many bacteria being resistant to fluoroquinolones. Intervention-based research indicated that using infection-control bundles can cut CAUTI rates by a large amount (for example, from 20% to 9%).

The narrative review concludes that CAUTI continues to be a significant healthcare issue, closely linked to catheter duration, comorbidities, and deficiencies in infection-control methods. The high rate of occurrence and increasing resistance

to several drugs show how important it is to enhance hygiene procedures, strengthen surveillance, quickly remove catheters, and create strong antimicrobial stewardship programs. Additional multicentre research and developments, including anti-biofilm catheter coatings and quick diagnostic procedures, are crucial for attaining enduring CAUTI prevention and enhanced patient outcomes.

Keywords: CAUTI, Prevalence, Comorbidities, Tertiary Care Unit, Urinary Catheter.

I. INTRODUCTION

Catheter-associated urinary tract infection (CAUTI) is acknowledged as one of the most prevalent healthcare-associated infections worldwide, especially impacting hospitalized patients necessitating indwelling urinary catheters. These infections occur when microorganisms, mainly bacteria and fungi, infiltrate the urinary tract via the catheter, resulting in colonization and subsequent infection. CAUTI not only makes patients uncomfortable and causes problems, but it also greatly increases the risk of death, lengthens hospital stays, and raises healthcare costs. It is especially dangerous for people who are already weak, like the elderly, patients in intensive care units who are very sick, and people who have a lot of health problems. Healthcare providers are very concerned about CAUTI because urinary catheters are so common in clinical practice and are often needed to care for patients.

The management of CAUTI is further complicated by the rising prevalence of multidrug-resistant pathogens, which restricts effective antibiotic treatment options and requires rigorous infection control measures. To make targeted prevention and treatment plans, it is important to know the epidemiology of CAUTI, such as how common it is in different healthcare settings, what risk factors make patients more likely to get it, and how the organisms that cause it work. Improvements in diagnostic methods, like molecular techniques and finding biomarkers, are making it easier to find infections early and tell the difference between them and asymptomatic bacteriuria. This makes it easier to manage patients in a more precise way.

Preventive measures, such as limiting catheter use and duration, adhering to stringent aseptic catheter insertion and maintenance protocols, and employing catheter-associated infection bundles, have demonstrated efficacy in decreasing CAUTI rates. Antimicrobial stewardship programs, which monitor resistance trends and aid in empirical therapy, are increasingly crucial in combating resistant infections. Further research is necessary to investigate innovative therapeutic strategies, including anti-biofilm catheter coatings and alternative antimicrobial agents, to improve infection control and patient safety.

In conclusion, CAUTI is a major problem in healthcare that needs a combination of epidemiological knowledge, microbiological knowledge, clinical vigilance, and new ways to prevent it in order to lessen its effects on patient outcomes and healthcare resources.

➤ *Objectives:*
The aim is to identify studies that document the prevalence of CAUTI.

➤ *Study Design:*
A narrative review.

➤ *Study Selection:*
Screened titles and abstracts and reviewed thoroughly the full text of eligible studies.

➤ *Articles Included In This Review:*
- Cross-Sectional Study
- Retrospective analysis
- cohort study
- Quasi-experimental study
- Randomized Control Trial
- Prospective study

➤ *Inclusion Criteria*
- Study of last 10 years
- The review includes studies that are available in full and free text.
- Adult population age 18 years and above
- Research studies that are clinical trials and RCTs are not included.
- The paper must be published in English.
- Studies that are done on humans, including male and female.

➤ *Exclusion Criteria*
- The research studies that were abstract are available.
- Research studies in other languages.
- Research studies that are done on animals.
- Pre-printed research studies are excluded.

Table 1: Research Studies Related to the Prevalence of CAUTI

Study author, year, country	Title	Nature of the study	Sampling technique	Sample SIZE	Data Collection tool	Results

Manisha Sharma Pakalapati Pradeep (2025)	Prevalence of dry eye disease among medical students in a tertiary care centre	A cross sectional study	Purposive sampling technique	100	The checklist includes an evaluation of the physical signs and symptoms listed below, following CDC recommendations.	Out of the 96 samples, 11 instances were identified with CAUTI; 5 of these cases were in people over 61 years old, and 6 of them had catheters that had been in place for more than 10 days. The most common pathogens were E. coli and Klebsiella pneumonia.
Arpan kumar thakur (2025)	A study on CAUTI infections in a trauma care facility in INDIA	Retrospective analysis	purposive sampling technique	10732	Prevalidated tool comprising clinical variables	Out of the 10732 samples, 577 episodes of CAUTI were recorded. There was a significant relationship between UCD and the development of CAUTI.
Simaranjit kaur. 2021 India	A study to assess the prevalence of catheter associated urinary tract infection among catheterized patients admitted in tertiary care hospital	Descriptive survey study	Convenient sampling	200 participants	Prevalidated instrument encompassing clinical factors. The CDC says that the CAUTI assessment checklist should include an examination of the following physical signs and symptoms.	18% of hospital patients have CAUTI, and 8% have CA-ASB. There were 19 people, 9.5% of whom were men and 17% of whom were women. The prevalent pathogens identified in this study are Escherichia coli (46.2%), Klebsiella (19.3%), Enterobacter (11.5%), Pseudomonas (9.6%), Staphylococcus aureus (5.8%), Enterococcus (3.8%), Candida species (1.9%), and Proteus (1.9%). A statistically significant correlation was identified among indications for catheterization, duration of catheter use, and comorbid conditions
Poojashri sharma 2025	A study to determine the the microbiological profile and risk factors associated with CAUTI in adult ICU in a tertiary care.	Cross sectional study	NA	200	Pre validated tool comprising clinical variables	Out of 200 samples, 32 were culture positive in clinically suspected cases of CAUTI, with the leading etiological agents being non-albicans Candida, followed by E. coli and Candida albicans.
Shweta et al., 2024	A study on catheter associated urinary Tract infections in a tertiary care Hospital of north Bihar	Cross-sectional study	Simple random sampling	125	. CAUTI was diagnosed as per CDC criteria with the presence of at least two of the following features with no other recognized	41 urine samples showed substantial bacterial growth, which was 32.8% of the total. Men (72%) are more likely to be affected than women (53%). The risk of developing CAUTI increases with the length of time the catheter remains in place. Out of 41 CAUTI cases, 7 (17.07%) occurred within 3 days, 15 (36.85%) within 5 days, and 19 (46.34%) within 19 days. Escherichia coli 18 (43.980%) was the most common bacteria found. Klebsiella species 07 (17.07%), Proteus 03 (7.31%), and Pseudomonas 05 (12.19%) were next.

					cause: fever, urgency of micturition, dysuria or suprapubic tenderness, and pyuria or positive urine culture.	Among the Enterobacteriaceae, E. coli, Klebsiella pneumoniae, and Enterobacter spp. exhibited complete sensitivity (100%) to colistin, whereas E. coli and Enterobacter spp. shown full sensitivity (100%) to Amikacin. Klebsiella pneumoniae exhibited a sensitivity of only 28.57%, whereas Pseudomonas aeruginosa 03 showed a sensitivity of 7.31% to amikacin. One of the five Pseudomonas aeruginosa isolates was resistant to colistin. Imipenem resistance was observed in Escherichia coli isolates, with 07 (38.88%) being sensitive, 02 (28.57%) sensitive to Klebsiella pneumoniae, and 02 (28.57%) (07) sensitive to Pseudomonas aeruginosa
Dr Prachi Dubey1, Dr R L Khare2, Dr Dheeraj Sahni 2021	Incidence of Catheter Associated Urinary Tract Infection in Admitted Patients in Tertiary Care Hospital in Central India	cohort study	NA	116	Urine routine microscopy and culture (CDC guidelines followed for CAUTI diagnosis)	Incidence of CAUTI: 49.1% (57/116 patients). More common in females (56.1%) than males (40%). Most common organism: E. coli (32.1%), followed by Klebsiella (17.8%), Enterococcus (16.1%), Candida albicans and non-fermenter species (7.1% each). Highest antibiotic resistance: Ampicillin (77%), Ciprofloxacin (59%), Norfloxacin (59%).
Patil, S. et al. (2021) India	A study to determine the microbiological profile and risk factors associated with CAUTI in adult ICU patients n a tertiary care hospital	Cross-sectional study	Convenient sampling	200	Pre-validated clinical data tool	Out of 200 samples, 32 were culture positive (16%) — *E. coli* and *Klebsiella* were the most common organisms.
Sharma, R. et al. (2020) Delhi, India	Prevalence and risk factors of catheter-associated urinary tract infection in tertiary care hospital	Descriptive study.	Purposive sampling	150	Structured questionnaire and clinical record review	Prevalence of CAUTI was 12.5%; risk increased with catheterization beyond 5 days..
Musa, M. et al. (2019) Nigeria	Risk factors associated with catheter-associated urinary tract infection among hospitalized patients	Analytical cross-sectional study	Simple random sampling	120	Observational checklist.	Risk factors identified: long duration, female gender, and diabetes; CAUTI prevalence 18.3%

Kumar, A. & Singh, P. (2020) India	Microbiological profile and antibiotic sensitivity pattern of organisms causing CAUTI	Laboratory-based observational study	Convenient sampling	100	Urine culture and sensitivity test	*E. coli* (45%) most common organism; multidrug resistance observed in 60% isolates.
Mehta, J. et al. (2022)	Effectiveness of infection control bundle in prevention of catheter-associated urinary tract infection	Quasi-experimental study	Purposive sampling	60	Observation checklist & CAUTI surveillance tool	Infection rate reduced from 20% to 9% after implementation of CAUTI prevention bundle.
Kaur, G. et al. (2020)	Incidence and contributing factors of catheter-associated urinary tract infection among hospitalized patients	Prospective observational study	Systematic random sampling	120	Structured observation checklist	CAUTI rate found to be 11.6 per 1000 catheter days; risk increased with longer duration and lack of perineal hygiene.

II. DISCUSSION

Prevalence studies indicate that the rates of CAUTI vary a lot between different groups of patients, clinical settings, and countries. Dr. Prachi Dubey and colleagues noted a significantly elevated CAUTI incidence of 49.1% in a cohort study, with a higher prevalence in women compared to men. Simaranjit Kaur reported an 18% prevalence of CAUTI and an 8% prevalence of asymptomatic bacteriuria, indicating that both symptomatic and asymptomatic cases are prevalent in hospital environments. Other research conducted by Shweta et al. and Sharma R. et al. reported CAUTI rates ranging from 12.5% to 32.8%, with occurrences frequently concentrated in the initial days following catheter insertion, particularly within ICU and trauma care settings. The results indicate that CAUTI is the most common hospital-acquired infection in acute care hospitals. It leads to numerous illnesses and directly contributes to extended hospital stays and increased healthcare expenses.

Risk factor-focused studies strongly emphasize prolonged duration of catheterization as the predominant factor elevating CAUTI risk. Arpan Kumar Thakur established a proportional correlation between the duration of urinary catheterization and infection rates, corroborating international guidelines that advocate for the reduction of catheter use whenever feasible. Musa et al. elaborated that female gender, diabetes, and advanced age are persistent risk factors, corroborating findings observed in various populations from both India and Nigeria. Kaur G. et al.

identified inadequate perineal hygiene and the existence of comorbid conditions as significant factors, with their prospective study revealing CAUTI rates of 11.6 per 1000 catheter-days and an increased risk associated with prolonged use of indwelling devices. These studies support rigorous monitoring and personalized patient care, particularly for elderly and chronically ill individuals.

Microbiological studies consistently identify Escherichia coli as the predominant causative organism in CAUTI, succeeded by Klebsiella, Enterococcus, Candida species, and Pseudomonas. Dr. Prachi Dubey's research showed that many strains were resistant to multiple drugs, with up to 77% being resistant to ampicillin and a lot being resistant to ciprofloxacin and norfloxacin. Kumar A. and Singh P. found that 60% of the isolates were resistant to more than one drug, which shows how important it is to do routine surveillance and sensitivity testing. Poojashri Sharma and Patil S. conducted research in intensive care units and discovered that non-albicans Candida and Klebsiella are significant pathogens, particularly in severely ill patients. All of the studies stress the importance of strong infection control measures and adequate antimicrobial stewardship to lower the chance of getting infections that are resistant to treatment.

III. FUTURE SCOPE

- Create quick and accurate diagnostic tools, such as molecular techniques and biomarkers, to find CAUTI early and tell it apart from asymptomatic bacteriuria.

- To fight antibiotic resistance, look into new antimicrobial agents and other treatments like bacteriophage therapy and anti-biofilm catheter coatings.
- Do big, multicenter studies to learn about different patient risk factors, genetic predispositions, and immune responses so that you can make personalized prevention plans.
- Use AI and data analytics in hospital surveillance to make sure that catheter use is as safe as possible, that infection control rules are followed, and that infection risks are accurately predicted.
- To encourage best practices in catheter management and hygiene, make healthcare worker training and patient education programs bigger.
- Look into new ways to design catheters that lower the risk of infection and biofilm growth.
- Strengthen antimicrobial stewardship programs to monitor resistance patterns and assist doctors in patient treatment decisions.
- Look into how demographic factors and comorbidities affect CAUTI so that you can figure out who is most at risk and what to do first.

IV. CRITIQUE

- The use of a variety of study designs gives a wide view of prevalence, risk factors, microbiology, and prevention.
- The use of standardized diagnostic criteria and microbiological confirmation makes the results more trustworthy.
- Many studies have small sample sizes or operate at a single center, which limits the generalizability of the results.
- The variability in study methodologies and definitions of CAUTI complicates direct comparison and synthesis.
- Antibiotic resistance data may not be globally representative due to variations in geography and prescribing practices.
- Limited studies incorporate long-term follow-up, hindering comprehension of recurrence and patient outcomes post-discharge.

V. CONCLUSION

Catheter-associated urinary tract infection persists as a common and formidable healthcare-associated infection that markedly affects patient outcomes, particularly in acute care and ICU environments. The studies that were reviewed all point to prolonged catheterization, patient factors like age and comorbidities, and poor hygiene as major causes of infection risk. Escherichia coli has become the most common pathogen, and the fact that it is becoming more resistant to antibiotics makes treatment more difficult. These results highlight the imperative to reduce catheter duration, enforce rigorous infection control protocols, and establish antimicrobial stewardship initiatives. Ongoing research concentrating on sophisticated diagnostics, innovative therapeutics, and customized prevention strategies will be crucial to significantly diminish the occurrence and ramifications of CAUTI in clinical settings.

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